

8-1 Multiplying Monomials (Pages 410–415)

An expression like $5x^2$ is called a **monomial**. A monomial is a number, a variable, or a product of a number and one or more variables. Monomials that are real numbers are called **constants**. To simplify a product involving monomials, write an equivalent expression in which: (1) there are no powers of powers, (2) each base appears exactly once, and (3) all fractions are in simplest form.

Product of Powers	You can multiply powers with the same base by adding exponents. For any number a , and all integers m and n , $a^m \cdot a^n = a^{m+n}$.
Power of a Power	You can find a power of a power by multiplying exponents. For any number a , and all integers m and n , $(a^m)^n = a^{mn}$.
Power of a Product	A power of a product is the product of the powers. For all numbers a and b , and any integer m , $(ab)^m = a^m b^m$.
Power of a Monomial	The power of a power property and the power of a product property can be combined into the power of a monomial property. For all numbers a and b , and all integers m , n , and p , $(a^m b^n)^p = a^{mp} b^{np}$.

Examples Simplify each expression.

a. $4x^2(5x^3)$

$$\begin{aligned} 4x^2(5x^3) &= (4 \cdot 5)(x^2x^3) \\ &= 20x^{2+3} \\ &= 20x^5 \end{aligned}$$

b. $(2x^3y)^4[(-2y)^2]^3$

$$\begin{aligned} (2x^3y)^4[(-2y)^2]^3 &= (2x^3y)^4(-2y)^3 \cdot 2 \\ &= (2x^3y)^4(-2y)^6 \\ &= 2^4(x^3)^4y^4(-2)^6y^6 \\ &= 2^4x^3 \cdot 4y^4(-2)^6y^6 \\ &= 16x^{12}y^464y^6 \\ &= (16 \cdot 64)x^{12}(y^4y^6) \\ &= 1024x^{12}y^{10} \\ &= 1024x^{12}y^{10} \end{aligned}$$

Practice

Simplify.

- $a^7(a)(a^2)$
- $(g^2h)(gh^4)$
- $(c^5d)(c^3d^5)$
- $[(3^2)^2]^2$
- $(2m^2n^8)(2mn^9)$
- $(x^2y^5)^4$
- $g^5(g^3s^3)$
- $(3abc)(6ab^2c^2)$
- $(0.3u)^4$
- $(\frac{5}{6}f)^2$
- $-\frac{4}{5}b(15t)^2$
- $(0.4j^3k^2)^2$
- $-4(rs^4t)^2$
- $(-2xy)^2(6y^8)$
- $(-4y^2)^2 - (4y)^4$
- $(\frac{1}{8}x^4)^2(8x^3)^2$
- $(\frac{3}{4}v^3)^3(16v)(8w)(\frac{1}{9}w^4)$
- $(2b)^4(\frac{1}{4}c^6)^3$
- Standardized Test Practice** Simplify $(a^2b)(ab^2)^3$.
 A a^5b^6 B a^5b^7 C a^6b^6 D a^9b^9

Answers: 1. a^{10}	2. g^3h^5	3. c^9d^6	4. 6561	5. $4m^3n^{17}$	6. x^8y^{20}	7. g^8s^3	8. $18a^2b^3c^3$	9. 0.0081	10. $\frac{36}{25}f^2$	11. $-180b^2t^2$	12. 0.16	13. $-4r^2s^8t^2$	14. $24x^2y^{10}$	15. $-240y^4$	16. x^{14}	17. $6v^{10}w^5$	18. $\frac{1}{1}b^4c^{18}$	19. B
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